Prospecting For Iron and Titanium Using Termitaria

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Introduction

Minerals and metals are a critical part of developing modern society by providing essential products, wealth, jobs and other opportunities. Mining has been important to the economic development of several industrialized countries such as Australia, Canada, Sweden and the United States.

Prospecting involves searching for mineral deposits with the view to mine it for profit. Exploration is the term used for systematic examination of a deposit. The recovery of metals from the earth starts with exploration. The use of plants in prospecting for minerals is referred to as **phytoprospecting** while use of insects and animals is **geozoological prospecting**.

Sampling of plant material in phyto-exploration programmes is relatively well developed and accepted , especially compared to geozoological techniques for mineral exploration. For example, gold and Uranium deposits were found in Canada through analysis of vegetation. Plant analysis has also been used for identification of copper in Zimbabwe, Zaire and South Africa.

Anthill (termitaria) prospecting theory was proposed in Zimbabwe in 1965 following the quantification of 2.835g of gold per tone of ant hill heaps built up on overburden Kalahari sand.

Termitaria have potential to be developed as a mineral exploration sampling medium because; (i) they are widespread and abundant across large regions of semi-arid tropical savanna regions in Africa making them readily available for mineral exploration programmes, (ii) they result from subsurface burrowing activity of termitaria and therefore their chemistry may reflect the chemistry of subsurface material and (iii) they can be conveniently and easily sampled at the land surface thereby minimizing environmental and cultural impact.

Termitaria are piles of earth, sand or clay found at the entrance of ant colonies. They are formed by industrious legions of worker ants for meeting variety of their needs such as dwelling, mating and storing food. It the construction of termitaria, water and soil are essential.

Figure 1: Plate of an anthill (termitaria)

Objective

This study sought to find out whether there are significant levels of iron and titanium in anthill soil samples compared to topsoil samples from Kwale, kathwama and Kithori which are mineralized areas in Kenya.

Methods

Study area : Study was carried out in Kwale and Tharaka Nithi counties, Kenya , where iron and titanium are known to occur. Mining of titanium is done at Kwale by an Australian company, base Titanium Limited. At Tharaka Nithi, two locations, Kithiori and Kathwana where iron and titanium had been mined on small scale were chosen.

Sample collection: Ten anthills were randomly selected and samples collected from various sections i.e., at the bottom, inside, mid-way up and at the top of the anthill. Soil samples collected 5 meters away from the selected anthills were used as controls.

Instrumentation: Acid digested samples were analysed for iron and titanium using flame atomic absorption spectrophotometry (FAAS). A spectra A10 spectometer was used at the mines and geology aboratory in Nairobi, Kneya. Hollow cathode lamps were used as excitation sources with resonance lines at 248.2nm and 364.3nm for iron and titanium respectively. Air-acetylene fuel system (flow rate 1.2L/min) and nitrous oxide-acetylene (flow rate 4.5L/min)were used to determine iron and titanium respectively.

Results

Table 1: Mean concentrations of Iron in mg/g

	Kwale	Kathwama	Kithori
A	20.63±0.09	90.53±0.00	82.63±0.22
B	23.63±0.10	98.51±0.22	86.74±0.23
I	27.12±0.06	97.90±0.31	93.68±0.30
M	23.05±0.00	99.13±0.28	90.24±0.03
T	24.40±0.01	98.56±0.10	87.18±0.22
MEAN CONCENTRATION OF ANTHILL	25.3±0.06	98.53±0.29	89.46±0.00

Table 2: Mean concentrations of Titanium in mg/g

	Kwale	Kathwama	Kithori
A	14.72±0.00	13.13±0.00	15.93±0.03
B	15.59±0.03	19.91±0.08	18.34±0.07
I	15.42±0.04	13.38±0.01	17.86±0.00
M	13.65±0.02	14.29±0.01	22.00±0.00
T	15.08±0.00	13.5±0.03	15.68±0.08
MEAN CONCENTRATION OF ANTHILL	14.94±0.24	14.52±0.03	18.47±0.03

Key

A: Adjacent (control) **B:** Bottom of anthill **I:** Inside of anthill
M: Middle of anthill **T:** Top of anthill

- Control samples had lower concentration of iron in all the three areas
- Titanium content in termitaria sample was higher than the control in all the three areas

Discussion

Iron and titanium levels were found to be higher in termiteria samples compared to controls. The higher iron and titanium content of the soil in termite moulds compared with the surroundings confirmed previous findings that soils have been transported from deep subsoil with high content of the underneath.

Conclusion

There were elevated levels of the two metals in termitaria soil compared to the surrounding soils. Termites are very important biotubators and are responsible for the higher levels of the metals in termitaria soil samples having brought debris containing the metals from underground. Termitaria can therefore be used as preliminary step in mineral prospecting since they provide an indication of the potential of positive anomaly, and enable a judgment on the scale of the ore metal occurrence.

Recommendation

Geological survey by systematic boring and processing under the subsurface of the proposed promising area for metal occurrence is recommedned. The study firther recommends miltinedia sampling approach .

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